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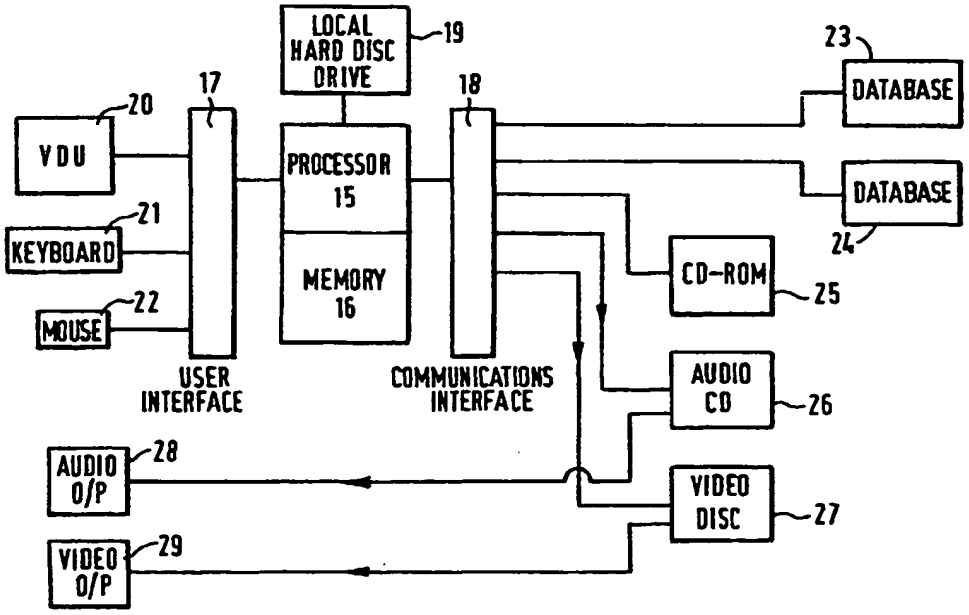

(57) Abstract

A system for accessing data is disclosed which has a communications interface (18) for communicating with data storage devices, such as external databases (23, 24) and optical discs (25, 26, 27) etc. Each data item has associated therewith a set of commands (45) for effecting the transfer of data. In addition, each item also has a number of attributes (41) identifying membership of the item to particular groups. The groups allow data to be obtained for all items which are within the group. Furthermore, the system is capable of providing logical processing of the attributes in order to define new groups. Thus, an AND operation, an OR operation, and exclusive OR operation or a subtraction may be performed upon groups so as to define new groups.

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ACCESSING DATA

FIELD OF THE INVENTION

The present invention relates to accessing data from data storage devices. The storage devices may include remote databases and the data may represent text, sound (speech or music) still images or video sequences.

BACKGROUND OF THE INVENTION

In known systems, access may be given to blocks of data each relating to a particular item. For example, blocks of data may be available for particular chemicals, particular modes of transport, particular buildings, particular computer peripherals etc., from which comparisons may be made of particular attributes, such as solubility in alcohol, miles per gallon, accessibility, ability to print in color etc. Thus, hundreds of items may be accessible for a particular topic, with, for example, tens of attributes being applicable to each item.

Looking at one of these topics, say, relating to chemicals, a user may be interested in solubility. Thus, all of the available data may be considered, referred to herein as the topic universe, to produce a list of all chemicals which are soluble in alcohol.

Subsequently, the universe of data may be considered again to provide a list of chemicals which are soluble in benzene. At a later stage, further information may be required from the universe concerning all chemicals which are soluble in both alcohol and benzene. Such an enquiry would require a list to be produced manually, derived from the previously obtained lists, and then instructions would be generated to request further data relating to the selected items.

Recently, there has been a trend towards providing access to many different types of data storing media. Thus, in addition to conventional databases, data may be supplied from local CD ROMS, audio discs and video discs. In conventional systems, problems exist in optimising access to these data sources and a significant amount of manual effort is necessary if access to a plurality of source is required.

An object of the present invention is to improve data access optimisation, particularly when related items are being considered from a particular topic and access to a plurality of sources is required.

SUMMARY OF THE INVENTION

According to a first aspect of the present

invention, there is provided apparatus for accessing data, comprising means for establishing a communication link to data storage means, characterised by: means for storing a set of instructions to effect the transfer to data, wherein each set of instructions has a name associated therewith and separately defined attributes identifying membership of the item to particular groups, and means for performing operations on said attributes.

In a preferred embodiment, the sets of commands are contained within respective item data units, wherein each item within a topic has a respective item data unit. Preferably, said attributes are one-bit flags, each representing membership to a particular group, when set. Some groups may be sub-groups of other groups and means are included for recording group hierarchy.

The means for performing operations upon attributes may be arranged to set attributes in response to data received from the storage means. Alternatively, the means for performing operations may be arranged to set attributes in response to local instructions from an operator. Thus, a group may be

formed of items having a particular attribute which is selected by the operator, this attribute possibly not being known to anyone else. Thus, in the chemical example, an operator may set an attribute for particular items identifying the fact that the item chemical is available from a particular source. Furthermore, in a preferred embodiment, the means for performing operations upon the attributes is arranged to define new groups from Boolean logical combinations of existing groups.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a schematic representation of a data access system and a plurality of data sources;

Figure 2 shows a physical representation of the data accessing system identified in Figure 1, including a processor with associated memory, arranged to perform logical operations in response to instructions read from said memory;

Figure 3 represents the organisation of topic-specific data stored in the memory of the system shown in Figure 2, including attribute flags;

Figure 4 details the attribute flags identified in Figure 3, when used for a specific topic;

Figure 5 details the operation of the system shown

in Figure 1, identifying the logical combination of groups;

Figure 6 details the operation of the system identified in Figure 5; and

Figures 7 to 10 detail specific logical operations performed upon attribute flags.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

A schematic functional representation of a data communication and processing system is shown in Figure 1, having a processor 15 with associated local memory 16, a user interface 17 and a communications interface 18. In addition, a local hard disc drive 19 is arranged to transfer data to and receive data from the memory 16.

The processor 15 includes an arithmetic logic unit, registers and an instruction counter. The memory 16 receives instructions from the hard disc unit 19, which are in turn read to control the operation of the processor 15. In addition, the memory device 16 also includes areas arranged to store data relating to a specific topic.

The instruction counter of the processor 15 is arranged to issue sequential addresses to the random access memory device, each resulting in the return of

an instruction to the processing unit. Instructions returned to the processing unit cause said unit to perform arithmetic operations and data transfers. Data is temporarily stored in registers, whereafter it may be written back to the memory device, transmitted to the user interface 17, written to the hard disc unit 19 or supplied to the communications interface 18.

Initially, upon start-up, the instruction counter is arranged to point at instructions within the memory 16 which control the operation of the system. These instructions relate to internal data transmission, that is, data transmission between the user interface 17, the processor 15, the memory 16 and the hard disc 19. Thus, the combination of these devices with the list of operating instructions from the memory device 19, provides an internal operating environment, allowing an operator to effect data transfers between these devices in response to operations supplied via the user interface 17.

The user interface 17 is connected to a visual display unit (VDU) 20, a keyboard 21 and a mouse 22 or similar devices for displaying data from the processor 15 and for supplying data to the processor 15.

In this example, the communications interface allows connections to be made to a first remote data base 23, a second remote data base 24, a CD ROM 25, an audio compact disc player 26 and a video disc player 27. Devices 25, 26 and 27 may be accessible to a user, allowing the user to load and replace encoded discs. Databases 23 and 24 may be remote, database 23 may be in the country of operation and database 24 may be an international database, requiring an international telecommunications link to be established. Outputs from alpha-numeric databases are returned to the communications interface 18. Audio signals from CD26 and video signals from player 27 are supplied to respective audio and video output devices 28, 29.

A physical implementation of the processor and user devices is shown in Figure 2, in which processor 15, memory 16, disc drive 19 and interfaces 17 and 18 are mounted within a main housing 31. In the preferred embodiment, the random access memory device provides four megabytes of storage capacity and the processing unit 18 is capable of receiving instructions from the memory at a rate of 4,000,000 instructions per second. The processor 15 is preferably in

integrated form, an example being the Acorn ARM chip, preferably working within a multi-tasking operating environment, such as that provided by the operating system RISCOS 3.

The communications interface 18 allows communication to be made to the external devices (23 thru 27) which do not come under the direct control of the processor's operating system. External devices of this type, which may be remote databases etc, operate under the control of their own respective systems and protocols must be establised to facilitate communication between the different environments.

For example, data may be read from an optical disc system, which may record sampled audio signals or, alternatively, alpha numeric data. The operating systems for such devices are complex; motors must be switched on to rotate discs, additional tracking motors must position laser devices and optics, while accurate positioning of the optical devices must be maintained to facilitate data transmission. Thus, the instructions generated to effect data transfered from remote devices, such as a laser disc unit, differ from the sort of operations performed to obtain data from the local hard disc unit 20. Specifically, to

effect internal transfers of data, the necessary low-level instructions will be embedded within the environment of the operating system. However, when requesting data from an external device, insufficient information will be available within the operating system for the transfer to be made. Additional information must be included, which specifically relates to the selected device with which data communication is to take place. Thus, in order to effect data transfer from an external device, it is conventional practice to issue commands via the user interface 17, identifying specific input/output ports and specifying instructions relevant to the type of device under consideration, along with the information identifying the location of the information required. Furthermore, physical reconnection of the system may be required, such as, for example, selecting an appropriate modem or selecting operation conditions for a modem.

In the present embodiment, all data transfers are made in response to the selection of an item or group of items within a particular topic. Thus, topics may relate to chemicals, particular modes of transport, particular buildings, or particular computer

peripherals, as previously described. Topic data is stored as a file or as a plurality of related files on the hard disc drive unit 19 and work within a particular topic is effected by transferring this data to the memory 16.

Topics consist of a plurality of items which are relevant to that particular topic. Thus, if the topic under consideration relates to chemicals, each item may, for example, be a particular chemical and data may be available, from data sources 23 thru 27, relating to properties of the chemical, applications of the chemical and/or availability of the chemical, etc. In another example, a topic may relate to modes of transport in which each item is a particular mode of transport, such as cars, buses, ferries and animal propelled transportation modes etc. Thus, in addition to providing access to databases and enabling the manipulation of attributes, the system also facilitates training and educational applications.

Data is stored in the memory 16 relating to each item, referred to herein as an item data unit. Two item data units 35 and 36 are shown in Figure 3 and many units of this type may be created; typically, hundreds of such units may be available. In addition

to item data units, memory allocations are also provided for a sub-group list 37, external access sub-routines 38 and a buffer 39 for the temporary storage of data from external sources.

Each item data unit includes a name 40, attribute flags 41, data defining an item graphic 42, internal data 43, a summary of externally available data 44 and instructions for accessing the external data 45.

The data identifying the name allows a name to be given to the item which represents the nature of the item. Thus, in the chemical example, the name identifies a particular chemical under consideration or, alternatively, in the transport example, the name may identify a particular form of transport. The attribute flags 41 are set by a user and allow the user to place items in, or identify items as belonging to, particular groups. Thus, for example, in the chemical example, a group may exist identifying whether a chemical is soluble in alochol and within each item data unit a flag will be present within the attribute flags area 41, stating whether or not the item is soluble in alcohol. Any number of groups of this type may be present and suitable memory allocation is provided within the attribute flags

area.

In the preferred embodiment, each item is displayed with, in addition to its name, a graphical representation of the item itself. This data is stored as graphics data, defining color and intensity values of pixels, within the item graphic area 42. Thus, the system may include a scanning device, allowing graphics information to be supplied to the processor 15 over the user interface 17. Alternatively, graphics information may be loaded to the system from an external source. In the transport example, in which items consist of cars, boats and planes etc, graphical representations of these forms of transport may be stored in the item graphic area 42. Furthermore, displayed graphics may be highlighted or modified in some other way, to identify membership of a particular selected group.

Area 43 contains internal data relating to the item itself. This internal data is usually created by the operater and may have been obtained from external data sources. Thus, as operation continues, data may be added to the internal data area, thereby increasing the amount of data available locally, thereby improving the accessability of said data without

requiring additional access to external sources.

Data may be available for each item from a plurality of sources and may take many forms. Data area 44, within the data unit, provides a summary of the nature of the external data available. Thus, the data contained within area 44 would identify databases and local sources which have information relating to the item under consideration. As new data sources become available, the data contained in the summary of external data may be updated by the operator.

In order to actually access the external data, instructions are provided within area 45 for effecting the transfer of data from the remote sources. Thus, once a mechanism for receiving data from a particular source relating to a particular item has been established, this data is recorded in area 45 for future reference. Thus, where data is being updated on a regular basis, search strategies may be established, whereafter the external data is quickly and automatically accessible, with reference to the instructions contained in area 45.

It will be appreciated that many instructions contained within area 45 will be repeated as access is made to particular databases for a plurality of items.

In order to conserve memory allocation, area 38 provides storage for external access sub-routines, which are in turn called from instructions provided within area 45. Thus, the sub-routines contained within area 38 may include dial-up codes for external databases or access codes for particular areas of storage contained on particular storage devices.

Many groups may in turn be sub-groups of larger groups. For example, groups may be provided identifying solubility in particular solvents, which in turn may all be sub-groups of a group which identifies solubility in something. Further operation of the system will be described with reference to a particular example, concerning the topic of transport, implemented primarily for educational purposes.

In this example, the number of items has been restricted to petrol car, diesel car, donkey, camel, yacht, balloon, windsurfer, bus and ferry. Attribute flags are provided for the following groups: air, land, water, wind, animal, chemical, petrol, diesel. The group "chemical" refers to the type of fuel used for the form of transportation, therefore the groups for petrol and diesel are sub-groups of the chemical group. Other sub-groups may be included

which have numerical values. For example, a group may exist for "having wheels" with sub-groups for "two wheels", "three wheels" and "four wheels" etc.

In the example topic, concerning transportation, nine item data units have been created, one for each of the nine items under consideration. Each item data unit includes a name, such as petrol car and eight setable attribute flags. Item graphic data has been supplied to respective areas 42, such that, on loading the topic data, a suitable graphic is displayed for each of the items. In addition, for each item, in this example, some internal data has been included, providing a brief description of the item along with some of its characteristics. Data is also included in areas 44 relating to a summary of the external data such that, for example, external data- bases may be accessed for the petrol car item, relating to specific types of car and road tests etc. In another example, video displays are available from the video disc unit 27 for the animal forms of transport, showing these animals performing their transportation duties. Similarly, a number of audio tracks are available from the audio CD 26 which relate to operating ferries, including interviews with sailors and

sailing songs. Thus, it will be appreciated that many permutations are available, allowing many different types of data to be supplied relating to a particular item.

Instructions for accessing the external data have been loaded to respective areas 45 such that, on selecting an external data source in response to prompts from the summary data provided at area 44, the external data can actually be assessed allowing, for example, a video display to be generated showing camels carrying people across a desert.

Attribute flags and a sub-group table for the transportation topic previously disclosed, are shown in Figure 4. As shown, each item includes eight attribute flags, one relating to air, one to land, one to water, one to wind, one to animal, one to chemical, one to petrol and one to diesel. These groups are created by an operator, as groups which are of interest to the operator in terms of accessing data. Once the items and groups have been selected, it is necessary for an operator to specify which items are members of which particular groups. In the tables shown in Figure 4, a star identifies the presence of an item within a particular group. Thus, considering

the first item, a petrol car, attribute flags for land and for petrol are set. Similarly, for the diesel car, attribute flags for land and for diesel are set. For the donkey, attribute flags for land and for animal are set and the same flags are set for the camel. For the yacht, attribute flags for water and wind are set, while the ballon attribute flags set are wind and air. For windsurfing, attribute flags for water and wind are set, while for the bus, attribute flags for land and diesel are set. For the ferry, attribute flags for water and diesel are set.

The sub-group table is created when groups are created, during which a group may be identified as being a sub-group of a previously defined group. Thus, the groups are listed vertically with an identification of "having sub-groups" listed horizontally. Flags within this table are set for each diagonal correlation, that is to say, the system is configured such that each entry is considered to have the sub-group of itself. In addition, other sub-groups may be present and in this example, as previously stated, the group chemical has sub-groups petrol and diesel in addition to itself.

An overview of the operation of the processing

system shown in Figure 1 is presented in Figure 5. The hard disc drive 19 may contain information relating to a plurality of different topics therefore, upon initiation, at step 51, a list of all available topics are displayed from which an operator may select one of these topics for further consideration. Topic selection is made at step 52 and at step 53 the topic data is loaded into the memory 16 from the local hard disc drvie 19. In some implementations, the system may be purpose built to operate with only one specific topic, in which case the initiation procedures, possibly in the form of an automatically executable batch file, result in the topic data automatically being loaded into memory, with control then proceeding to step 54. At step 54 the universe of available items within the topic are displayed, preferably in the form of icons or sprites derived from the item graphic data 42 of each item data unit.

At step 55 a user is presented with an option to create new groups, such as the groups identified in Figure 4. Thereafter, at step 56, an operator is presented with an opportunity to place items in groups. Thus, a particular group may be selected and items may be added to this group by directing a cursor

over the item's respective graphic and implementing an instruction so as to cause the representation of the graphic to be modified in some way. Thus, the instruction may involve the "clicking" of a button on the mouse 22 and the modification to the graphic data may consist of the data being higlighted in some way. Thus, during further operation, membership of a particular group will be displayed on the VDU 20 by the respective graphic being highlighted.

At step 57 new groups are effectively defined by logically combining existing groups. Thus, a new group may be formed by a logical AND, a logical OR, a logical exclusive OR, or a subtraction, as detailed subsequently.

The ability to logically combine groups allows selection to be made as to the particular nature of data required from external sources, before that data is actually accessed. At step 58, once the group of interest has been created and selected, external data is accessed for each item within the selected group, using the instructions for accessing external data at locations 45 and the external-access-sub-routines at area 38, as required.

At step 59 an opportunity is given to modify

groups and items, particularly in response to the data that has been accessed at step 58. Thus, in response to the data access at step 58, groups may be modified and new groups defined. For example, in response to data received from external sources, it may become apparent that an item should not have been included in the group or, alternatively, it may become apparent that further investigations should be made with regard to items which were previously excluded from the group.

Information received from external sources is automatically transferred to the buffer area 39 of memory 16. The data loaded to the buffer area 39 may also be stored permanently on the hard disc 19. Thus, the data received from external sources, when in alpha-numeric form, may be evaluated either automatically or by the user, allowing modifications to be made to item data units. For example, in response to data received from external sources, data may be added to the internal data areas 43, thereby increasing the amount of data stored locally in a logical format, which in turn may reduce the number of occasions when data is required to be read from the external sources, it being noted that many external

databases charge users on the basis of the amount of data supplied or connection time to the database. Furthermore, data received from external databases may also be used to modify areas 44, giving a summary of the nature of the data available from these sources. Furthermore, in addition to attribute flags being set by a user, they may also be set automatically in response to information received from external sources. Thus, an attribute flag may remove the necessity to make further investigations to the data base, by identifying data retrieved from the data base. Alternatively, the flags may be set to define user related groups, possibly, on information which is not available from the data base. Once groups have been defined in these ways, new groups may also be produced by performing Bolean logical operations upon the groups.

After groups or items have been modified as required at step 59, control may be returned to step 54, displaying the universally available items. Alternatively, modified data may be stored on the hard disc 19 and control returned to step 51, displaying all of the available topics.

Procedures for the logical combination of groups,

identified at step 57 of Figure 5, are detailed in Figure 6. At step 61 the universe of items is displayed, in a similar fashion to the display of items at step 54. At step 62 a group (created at step 55 of Figure 5 and having items placed therein at step 56 of Figure 5) is selected and at step 63 the selected group is identified in the display of items.

Group selection is identified within the display of items by highlighting the graphic representation of items which are present within that group. At step 64 a question is asked as to whether the operator wishes to make a new universe from the highlighted selected group. If this question is answered in the affirmative, step 65 deletes all of the non-highlighted items, that is to say, the items which are not present within the group, while retaining the highlighted items. Furthermore, given that items outside the group have been deleted, the highlight is removed, thereby presenting a modified universe of items. It should be noted, however, that the original total universe is retained in memory and may be recalled later in response to operator instructions control then returns to step 61.

At step 66, after the question raised at step 64 has been answered in the negative, a logical operator is selected which performs an operation between the highlighted (usually the previously searched) group and a new group to be selected. At step 67 a new group is selected. Thus, the first selected group is identified in Figure 6 as A, or, alternatively, a group may be selected on the basis of all the items which are not within a particular group, identified as $\bar{A}$ (A bar). Similarly, the second group is identified as group B which may be a true group, identified as B, or a group derived from all of the items outside a group B, again identified as $\bar{B}$ (B bar).

At step 68, the operation of A with B is performed and the result is displayed, by modifying the highlighting of items, at step 69. At step 70, a question is raised as to whether the user wishes to make a new universe, thereby deleting the non-highlighted items which are not present in the new group. If this question is answered in the affirmative, control is returned to step 65. Alternatively, at step 71 a question is raised as to

whether another operation is to be performed and upon answering this question in the affirmative, control is returned to step 66, allowing a further operator to be selected and the procedure repeated with the newly formed group becoming group A and another selected group becoming group B.

Upon answering the question raised at step 71 in the negative, a question is raised at step 72 as to whether a new group is to be formed. Thus, the logical operations performed on existing groups may be used to define a new group, which will itself have an attribute flag in each of the item data units. If the question raised at step 72 is answered in the affirmative, the new group is formed at step 73, whereafter control is returned to step 61, displaying the universe of items. The particular operations performed at step 65 through 68 will depend upon the particular operator selected.

As shown in Figure 6 as step 65, the preferred embodiment provides four types of logical operations to be performed, namely logical OR (union), logical AND (intersection), logical exclusive OR (not intersection) and substraction. When subtraction is selected, the result consists of the members of a

first set with the members of a second set, which are also present in the first set, subtracted therefrom.

The procedures implemented for the union of sets, providing a logical ANDing of groups, is detailed in Figure 7. Step 75 is effectively a summary of previously implemented steps in Figure 6, resulting in the selection of a first group A, the selection of the union operator and the selection of a second group B. The effect of the union operator is shown by Venn diagram 76, in which the union of sets A and B results in a new group containing all the items which were present in either group A or group B. Thus, all items of the universe have a logical position within one of the regions of the Venn diagram 76. Items which are in both groups A and B will be positioned within the intersecting region 77, showing that they belong to both set A and set B. Items in group A but not in group B would be placed within region 78 and, similarly, items in group B and not in group A would be placed within region 79. All remaining items, not being in group A or group B would be placed in the universal region 80, outside the boundaries of set A and set B.

Step 61 of Figure 6 will have displayed the

universe of items and step 62 will have provided for a first group A to be selected. This selected group is then identified on the display by means of highlights, that is to say, the graphical representation of the item is highlighted, its luminance value being modified compared to that of the remaining items displayed on the screen.

Thus, at step 75 in Figure 7, group A has been selected and this selection will be identified to the user by means of highlights being applied to the items within that group. The union operator has been selected, group B has been selected and the subsequent processing shown in Figure 7 will modify the highlighting of the items, such that, highlighting will change from showing just group A to showing the union of group A with group B.

During the processing identified in Figure 7, all items are considered sequentially, thus, at step 81, the next item on the list of items is considered.

At step 82 a question is raised as to whether the item is in group A. If the item is in group A, the highlight flag for that particular item will have already been set, at step 63, and no further action is required. If the item is not in group A a question

is asked at step 83 as to whether the item is in group B. If this question is answered in the affirmative, the item's logical position within the Venn diagram 76 is within region 78, given that it is within group B but not within group A. Consequently, at step 84, the highlight flag is set and the processing continues. At step 85 a question is asked as to whether the item considered was the last item and when this question is answered in the negative, control is returned to step 81 where the next item is considered.

If the question raised at step 82 is answered in the affirmative, to the effect that the item is in group A, or if the question raised at step 83 is answered in the negative, to the effect that the item is not in group B, control is passed directly to step 85, thereby bypassing the setting of a flag at step 84.

When all items of the system's universe have been considered, all items which would have logically been positioned within region 79 of the Venn diagram will have had their highlight flags set, thus, the overall picture of highlights will represent the logical ORing of the groups, equivalent to the set operation of a

union of set A with set B. Subsequently, the question raised at step 85 will be answered in the affirmative, to the effect that all items have been considered and control will be returned to step 68 of Figure 6.

Referring to the particular example given in Figure 4, the union operator shown in Figure 7 may, for example, be used to form a new group which contains items relating to transportation over land or over water, thereby excluding transportation by air. The land group could be selected as group A which, at step 75, would result in the highlight flag being set for petrol car, diesel car, donkey, camel and bus. The water group would then be selected as group B and the question raised at step 83 would result in the highlight flag being set for yacht, windsurfer and ferry.

The operations performed for the logical ANDing of groups, equivalent to the set operation of intersection, is detailed in Figure 8. The Venn diagram shown in Figure 7 is repeated in Figure 8, with the same numerals being used to identify equivalent regions of the digram. The region of interest for the intersection operation is region 77, that is to say, items which are in both group A and

group B, equivalent to a logical AND operation.

Step 91 is equivalent to step 75 in Figure 7, in that, group A is selected as the first group, resulting in the items in that group having their highlight flag set. On this occasion, however, the intersection operator is selected, whereafter group B is selected.

At step 92 the next item in the list of items is considered and at step 93 a question is raised as to whether the item is in group A. If the item is not in group A the highlight flag for the item will not have been set and not further action is required. If the question raised at step 93 is answered in the affirmative, confirming that the item is in group A, a further question is raised at step 94 as to whether the item is in group B. If the item is in group A and in group B, its highlight flag will have already been set and no further action is required. However, if the question raised at step 94 is answered in the negative, confirming that the item is not in group B but only in group A, the item belongs to region 78 of the Venn diagram and, therefore, at step 95 its highlight flag is reset, given that the item does not fall within the new group defined by the intersection

of sets A and B.

At step 96 a question is raised as to whether the last item has been considered and if this question is answered in the negative, control is returned to step 92, where in the next item in the list is considered. If the question raised at step 93 is answered in the negative or if the question raised at step 94 is answered in the affirmative, control is supplied directly to step 96, thereby bypassing the flag resetting operation at step 95. After considering the last item of the list, the question raised at step 96 is answered in the affirmative and control is returned to step 68 of Figure 6.

Referring to the specific example given in Figure 4, the intersection operation may be used, for example, to produce a new group of items which involves transportation over water using wind power. Thus, the water group may be selected as group A, resulting in the highlight flag for the yacht, windsurfer and ferry being set. Subsequently, the question raised at step 93 will be answered in the affirmative for the ferry and the question raised at step 94 for this item will be answered in the negative, given that the attribute flag for wind is

not set for this particular item. Thus, the highlight flag for ferry will be reset at step 95, resulting in a new group which includes only the yacht and the windsurfer.

The not intersection operations are detailed in Figure 9 and again the Venn diagram 76 is shown. As shown in Figure 8, intersection relates to region 77 of the Venn diagram therefore, not intersection relates to the regions within set A and set B, excluding the intersection of these two sets. Thus, the new set includes region 78 and region 79, but excludes region 77.

At step 101, group A has been selected and highlighted, the operator "not intersection" has been selected and group B has been selected. At step 102 the next item is considered and the question is raised at step 103 as to whether the item is in group A. If the question raised at step 103 is answered in the affirmative, it is possible that the item would be positioned within region 77 or region 78. If the item is within region 78, no further action is required because the highlight flag is required to be set. However, if the item would be positioned within region 77, the highlight flag needs to be re-set. Thus, a

question is raised at step 104 as to whether the item is in group B. If this question is answered in the affirmative, the item would exist within region 77 and the highlight flag is reset at step 105. No action is required if the question raised at step 104 is answered in the negative.

If the question raised at step 103 is answered in the negative, the item is not in group A, therefore it may fall within region 79 or within region 80. If the item is within region 79, its highlight flag will not have been set and it will need to be set. Thus, a question is raised at step 106 as to whether the item is in group B. If this question is answered in the affirmative, the item belongs to region 79, therefore, its highlight flag is set at step 107. If the question raised at step 106 is answered in the negative, the item would exist in region 80 and no further action is required.

A question is raised at step 108 as to whether the item is the last item in the list and when this question is answered in the negative, the next item is considered at step 102. Eventually, the question raised at step 108 will be answered in the affirmative and control will be returned to step 68 at step 109.

The procedures for the "subtract" operator are detailed in Figure 10 and, again, the Venn diagram 76 is shown in the Figure, identifying the region of interest as region 78, that is to say, the region consisting of the region representing set A with the region 77, representing the intersection of set A with set B, removed therefrom.

At step 111, group A has been selected and the highlight flag for items in this group set. In addition, the "subtract" operator has been selected and group B has been selected.

At step 112 the next item is considered and a question is raised at step 113 as to whether the item is in group A. If the item is not in group A it would be placed within region 79 or region 80 of the Venn diagram 76 and no further action is required. If the question raised at step 113 is answered in the affirmative, a question is raised at step 114 as to whether the item is in group B. If this question is answered in the affirmative, the item is in both group A and group B and belongs to region 77 of the Venn diagram. Being in group A, its highlight flag will have been set and given that it is also within group B it is necessary to re-set the highlight flag. Thus, if

the question raised at step 114 is answered in the affirmative, the highlight flag is reset at step 115.

A question is raised at step 116 as to whether the item is the last item in the list and if this question is answered in the negative, control is returned to step 112. If the question raised at step 113 is answered in the negative or if the question raised at step 114 is answered in the negative, control is directed towards step 116 and the re-setting operation at step 115 is ignored.

Eventually, all items will have been considered and the question raised at step 116 will be answered in the affirmative, resulting in control being returned to step 68, at step 117.

It will be appreciated that every item includes, within its item data unit, the necessary information for accessing data relating to that item. By including a region for internal data and a summary of external data, information derived from external sources may be placed within logical regions, thereby facilitating the easy retrival of said information. By including space for defining graphical information, the item may be identified by its graphical icon,

faciliatating manipulation within a graphics environment, such as that provided by GEM or windows etc.

The system is enhanced greatly by the provision of attribute flags, defining membership of items within particular groups or sets. Furthermore, logical manipulation of the attribute flags allows new groups to be defined and these groups may in turn be used to access external data relating to the items within the group. Thus, significant improvements to data organisation and collation may be effected before an enquiry is made to external data sources, thereby optimising access time to said sources.

CLAIMS

1. Apparatus for accessing data, comprising means (15, 18) for establishing a communication link to data storage means; characterised by

means (45) for locally storing sets of instructions to effect the transfer of data from said storage means, wherein

each set of instructions has a name (40) associated therewith and

separately defined attributes (41) identifying membership of the item to particular groups, further comprising

means (15) for performing operations on said attributes.

2. Apparatus according to claim 1, wherein data is accessed from a remote database.

3. Apparatus according to claim 2, including a modem for accessing data from the database over a public switched network.

4. Apparatus according to claim 2, wherein said stored instructions are arranged to call-up a database and to effect the transfer of data therefrom.

5. Apparatus according to claim 1, wherein data is accessed from an optical disc by means of an optical disc player (25, 26, 27).

6. Apparatus according to claim 5, wherein the optical disc player is local and the apparatus generates prompts identifying particular discs to be loaded.

7. Apparatus according to claim 5 or claim 6, wherein the optical disc player is arranged to supply alpha-numeric data to a central processor (15).

8. Apparatus according to claim 5 or claim 6, wherein the optical disc player is arranged to generate audio signals or video signals which are relayed to reproduction equipment (28, 29).

9. Apparatus according to claim 1, wherein said sets of instructions are contained within respective item data units (35), wherein each item within a topic has a respective item data unit.

10. Apparatus according to claim 9, wherein said attributes (41) are stored within their respective item data unit.

11. Apparatus according to claim 1, wherein said attributes (41) are one-bit flags, each representing membership to a particular group.

12. Apparatus according to claim 1, wherein some groups are sub-groups of other groups, said apparatus including means (15, 16, Figure 4) for recording group hierarchy.

13. Apparatus according to claim 1, wherein said means for performing operations on the attributes is arranged to set said attributes in response to data received from the data storage means.

14. Apparatus according to claim 1, wherein said means for performing operations on the attributes is arranged to set said attributes in response to local instructions from an operator.

15. Apparatus according to claim 1, wherein said means (15, 67) for performing operations upon said attributes is arranged to define new groups from logical combinations of existing groups.

16. Apparatus according to claim 15, including means (15, Figure 7) for producing a new group by performing a logical OR operation on existing groups.

17. Apparatus according to claim 15, including means (15, Figure 8) for producing a new group by performing a logical AND operation on existing groups.

18. Apparatus according to claim 15, including means (15, Figure) for producing a new group by performing a logical exclusive OR on existing groups.

19. Apparatus according to claim 15, including means (15 Figure 10) for producing a new group by subtracting the items in a group from another group.

20. Apparatus according to claim 9, wherein each item data unit (35) includes data (42) defining a graphical representation of the item.

21. Apparatus according to claim 20, wherein available items are identified by displaying the graphical representation of the item.

22. Apparatus according to claim 21, wherein membership of a group is identified by modifying the nature of the graphical representation of the item.

23. A method of accessing data, characterised by the steps of performing operations upon data items to generate a group of items for which data access is required.

24. A method according to claim 23, wherein each data item includes attributes and the operations are performed on these attributes.

25. A method according to claim 24, wherein operations are performed on attributes in response to accessed data.

26. A method according to claim 24, wherein operations are performed on said attributes in response to local selections made by an operator.

27. A method according to claim 23, wherein each data item includes a set of instructions for effecting data transfer.

28. A method according to claim 27, wherein said data transfer is effected from remote sources in response to said instructions.

29. A method according to claim 24, wherein said attributes are one-bit flags, each representing membership to a particular group.

30. A method according to claim 23, wherein groups are generated from logical operations performed on previously defined groups.

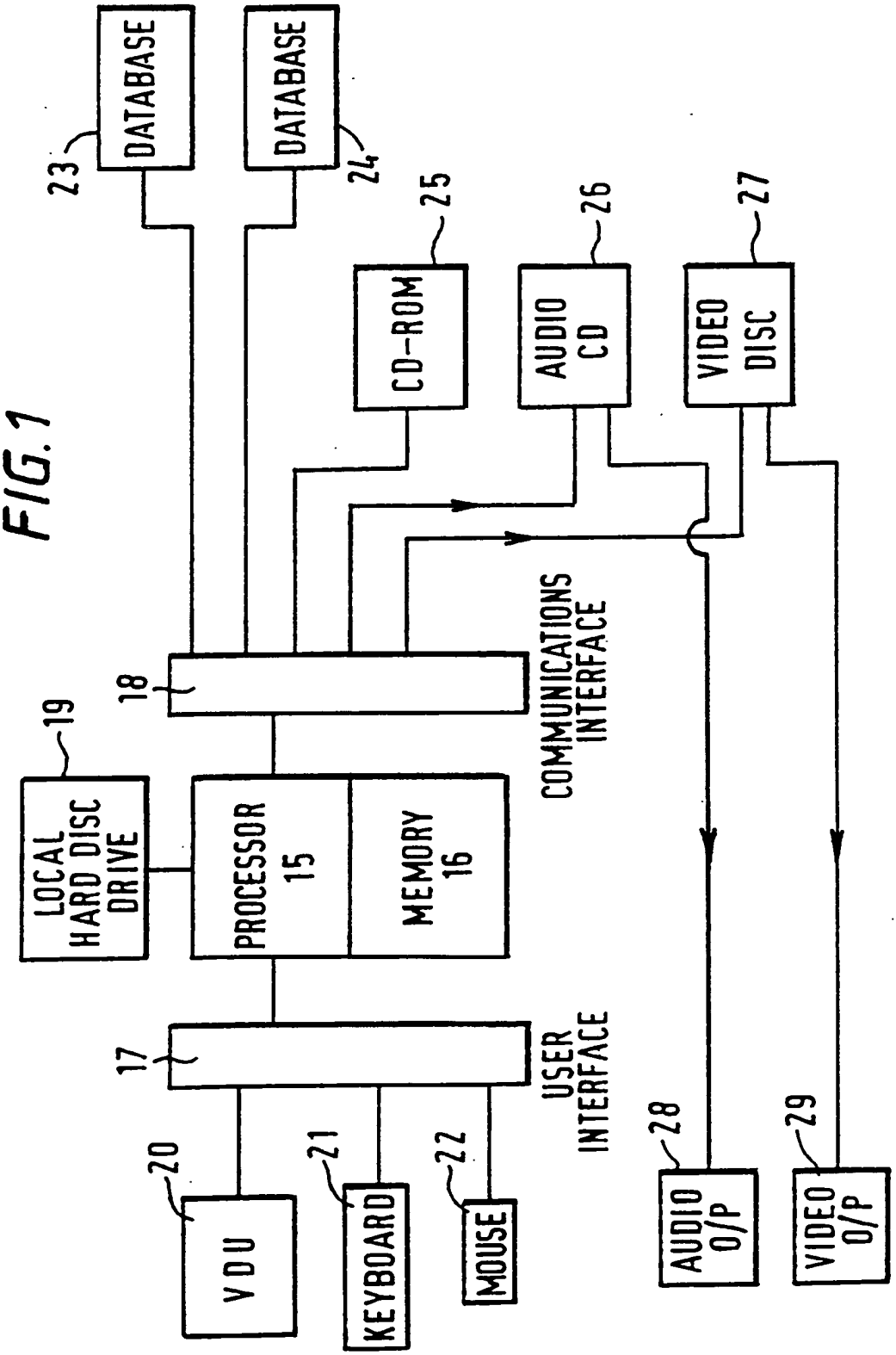
31. A method according to claim 30, wherein a new group is defined by performing an AND operation, an OR operation, an exclusive OR operation or a subtractive operation upon existing groups.

32. A method according to claim 23, wherein items are represented as graphical representations, in response to graphic information stored for each item.

33. A method according to claim 32, wherein membership of a group is identified by modifying the nature of the graphical representation.

34. A method according to claim 33, wherein graphical representations are highlighted in response to respective highlight flags being set.

FIG. 1


DATABASE
23
DATABASE
24
CD-ROM
25
AUDIO CD
26
VIDEO DISC
27
COMMUNICATIONS INTERFACE
18
LOCAL HARD DISC DRIVE
19
PROCESSOR 15
MEMORY 16
USER INTERFACE
17
VDU
20
KEYBOARD
21
MOUSE
22
AUDIO O/P
28
VIDEO O/P
29

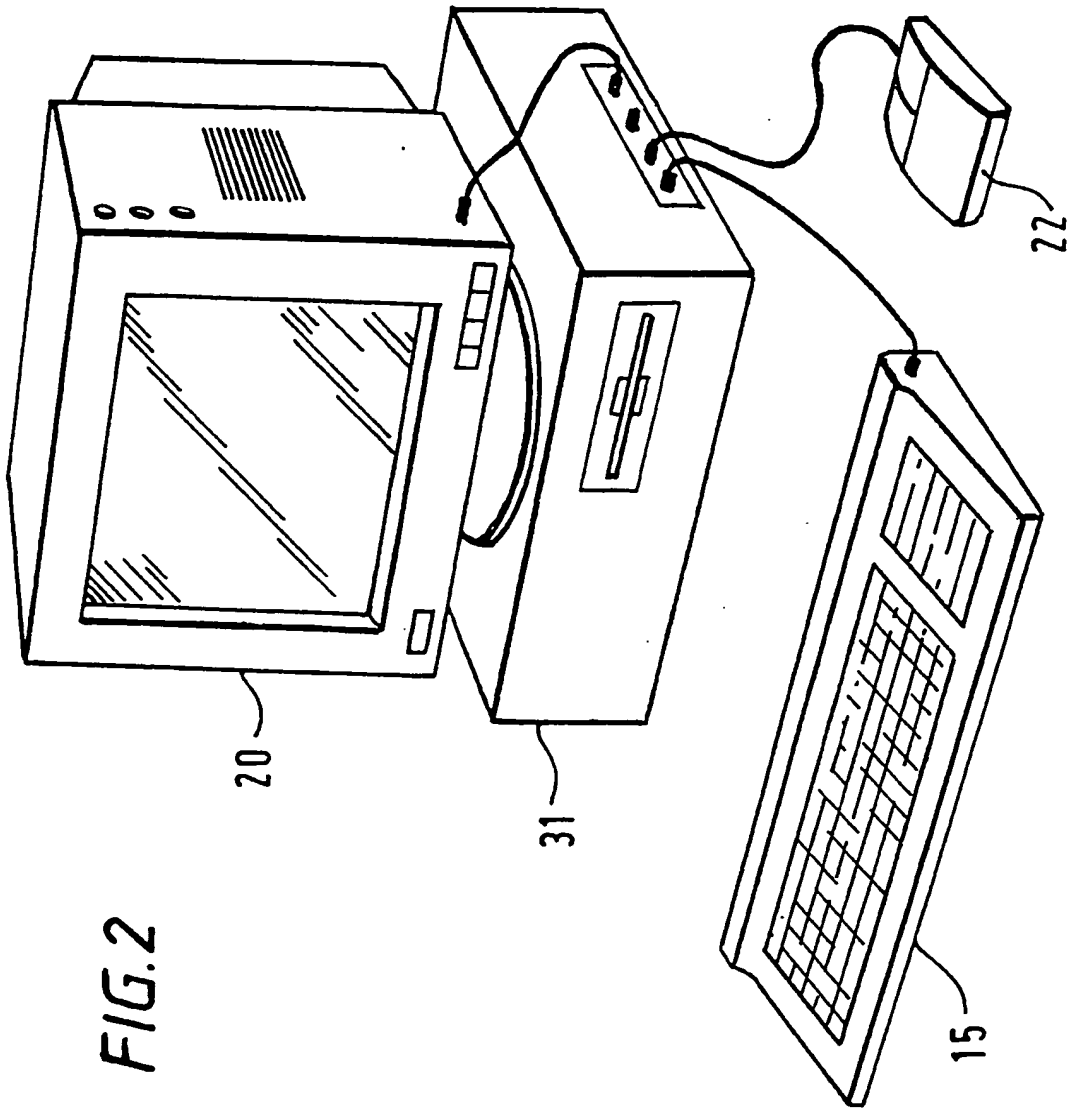


FIG.2

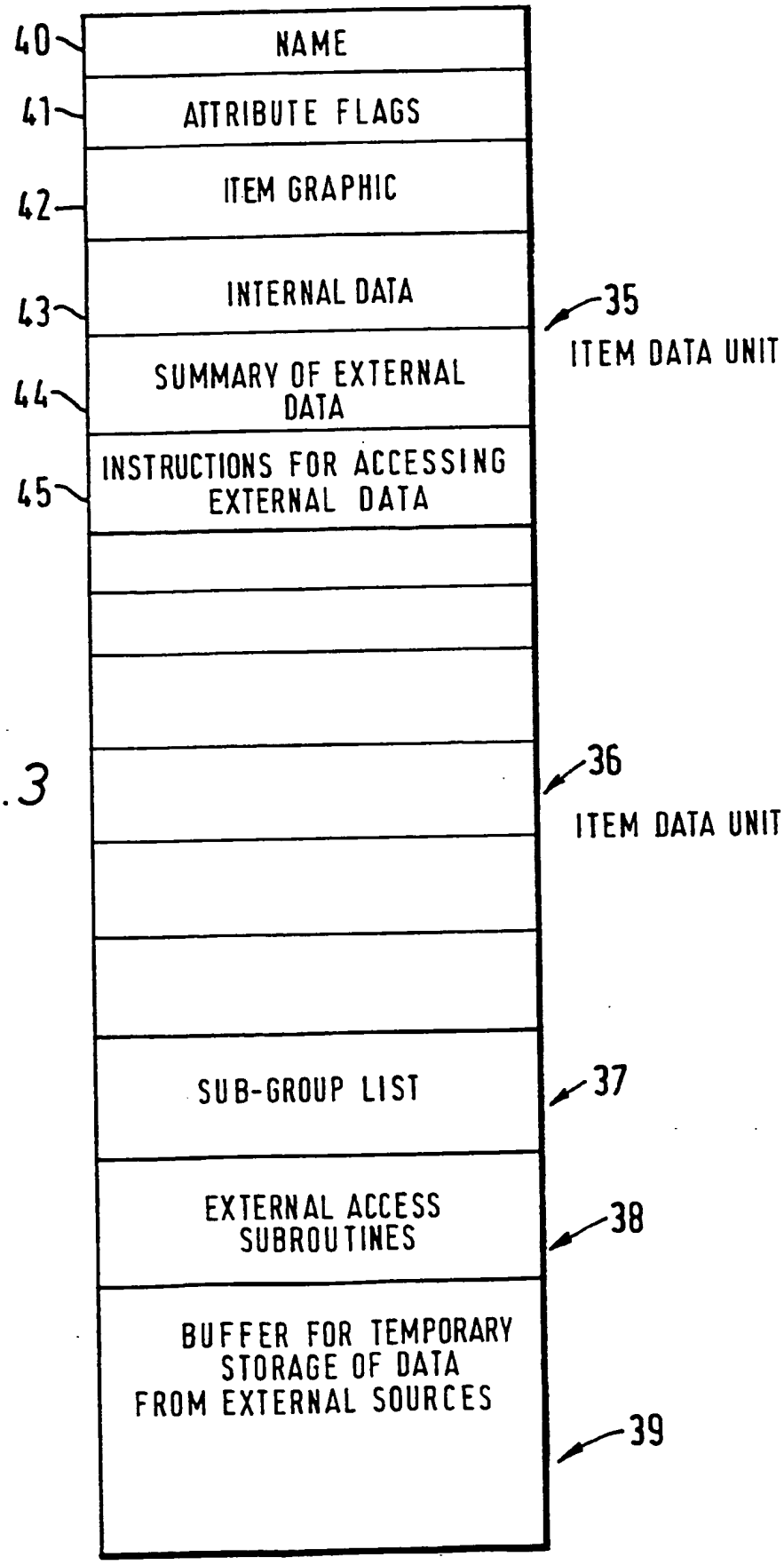

40
NAME
41
ATTRIBUTE FLAGS
42
ITEM GRAPHIC
43
INTERNAL DATA
44
SUMMARY OF EXTERNAL DATA
45
INSTRUCTIONS FOR ACCESSING EXTERNAL DATA
35
ITEM DATA UNIT
36
ITEM DATA UNIT
SUB-GROUP LIST
37
EXTERNAL ACCESS SUBROUTINES
38
BUFFER FOR TEMPORARY STORAGE OF DATA FROM EXTERNAL SOURCES
39

FIG.3

ATTRIBUTE FLAGS

GROUPS

ITEMS	AIR	LAND	WATER	WIND	ANIMAL	CHEMICAL	PETROL	DIESEL	HIGHLIGHT FLAGS
PETROL CAR		*					*		
DIESEL CAR		*						*	
DONKEY		*			*				
CAMEL		*			*				
YACHT			*	*					
BALLOON	*			*					
WIND SURF			*	*					
BUS		*						*	
FERRY			*					*	
	1	2	3	4	5	6	7	8	

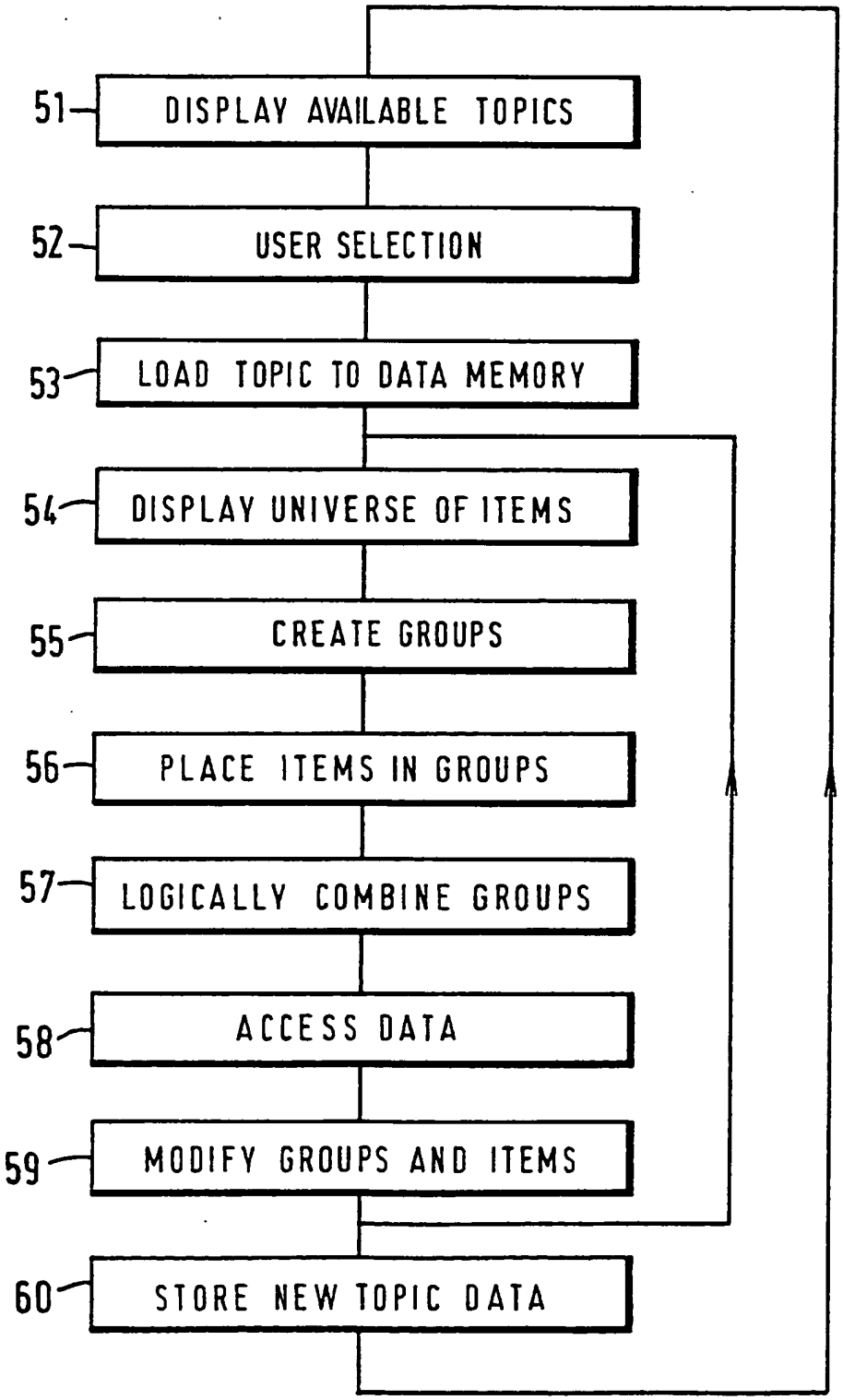
FIG.4

HAVING SUB GROUPS

GROUP	AIR	LAND	WATER	WIND	ANIMAL	CHEMICAL	PETROL	DIESEL
AIR	*							
LAND		*						
WATER			*					
WIND				*				
ANIMAL					*			
CHEMICAL						*	*	*
PETROL							*	
DIESEL								*

SUB GROUP TABLE

FIG. 5


51
DISPLAY AVAILABLE TOPICS
52
USER SELECTION
53
LOAD TOPIC TO DATA MEMORY
54
DISPLAY UNIVERSE OF ITEMS
55
CREATE GROUPS
56
PLACE ITEMS IN GROUPS
57
LOGICALLY COMBINE GROUPS
58
ACCESS DATA
59
MODIFY GROUPS AND ITEMS
60
STORE NEW TOPIC DATA

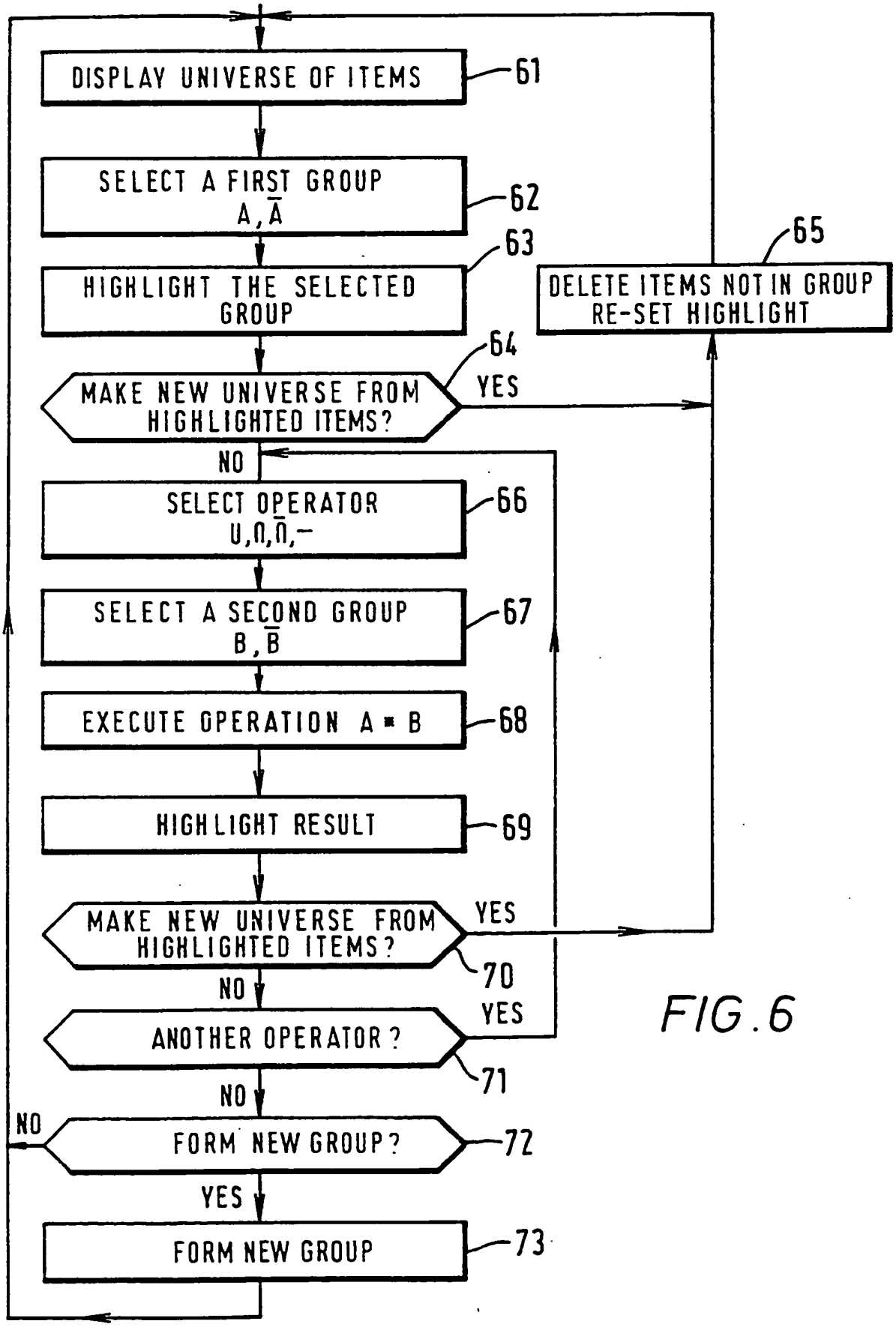
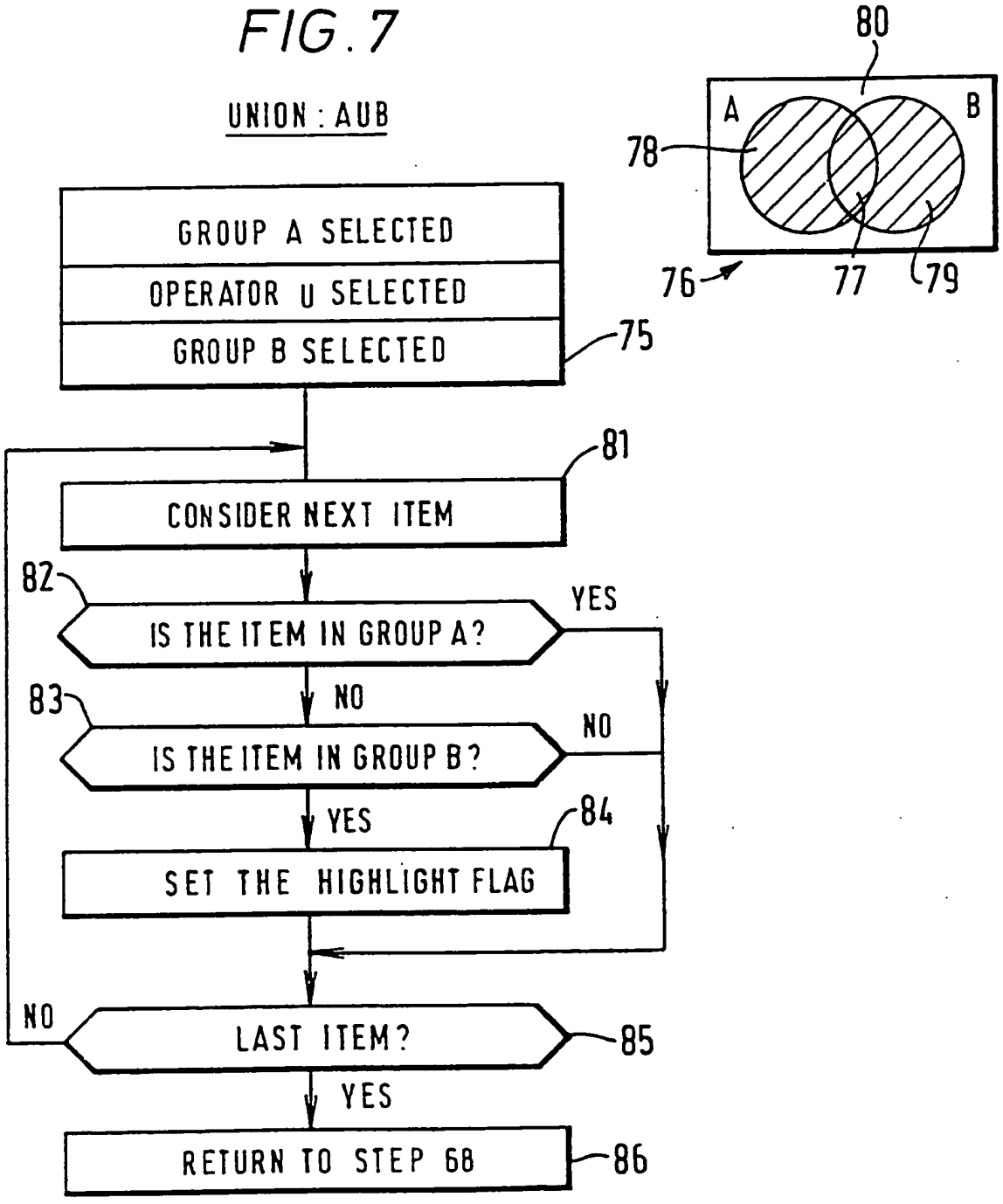

DISPLAY UNIVERSE OF ITEMS
61
SELECT A FIRST GROUP
A, Ā
62
HIGHLIGHT THE SELECTED GROUP
63
MAKE NEW UNIVERSE FROM HIGHLIGHTED ITEMS?
64
YES
NO
DELETE ITEMS NOT IN GROUP
RE-SET HIGHLIGHT
65
SELECT OPERATOR
U, ∩, ∩̄, −
66
SELECT A SECOND GROUP
B, B̄
67
EXECUTE OPERATION A * B
68
HIGHLIGHT RESULT
69
MAKE NEW UNIVERSE FROM HIGHLIGHTED ITEMS?
YES
70
NO
ANOTHER OPERATOR?
YES
71
NO
NO
FORM NEW GROUP?
72
YES
FORM NEW GROUP
73

FIG. 6

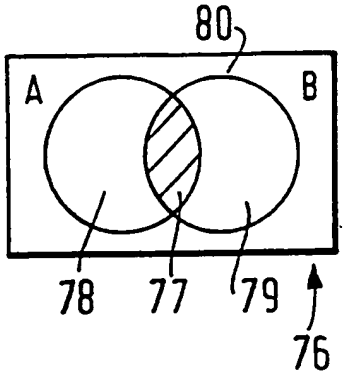
FIG. 7

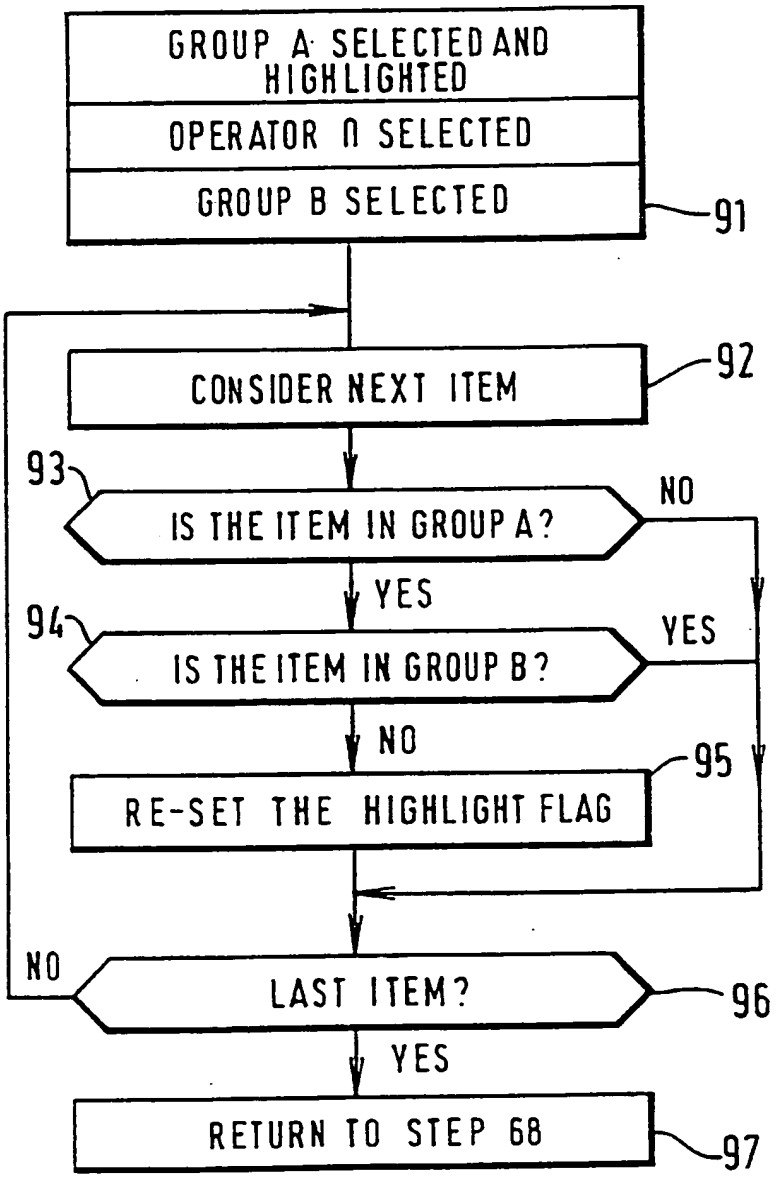


EXAMPLE: LAND OR WATER

FIG. 8

INTERSECTION A∩B





EXAMPLE: WATER AND WIND

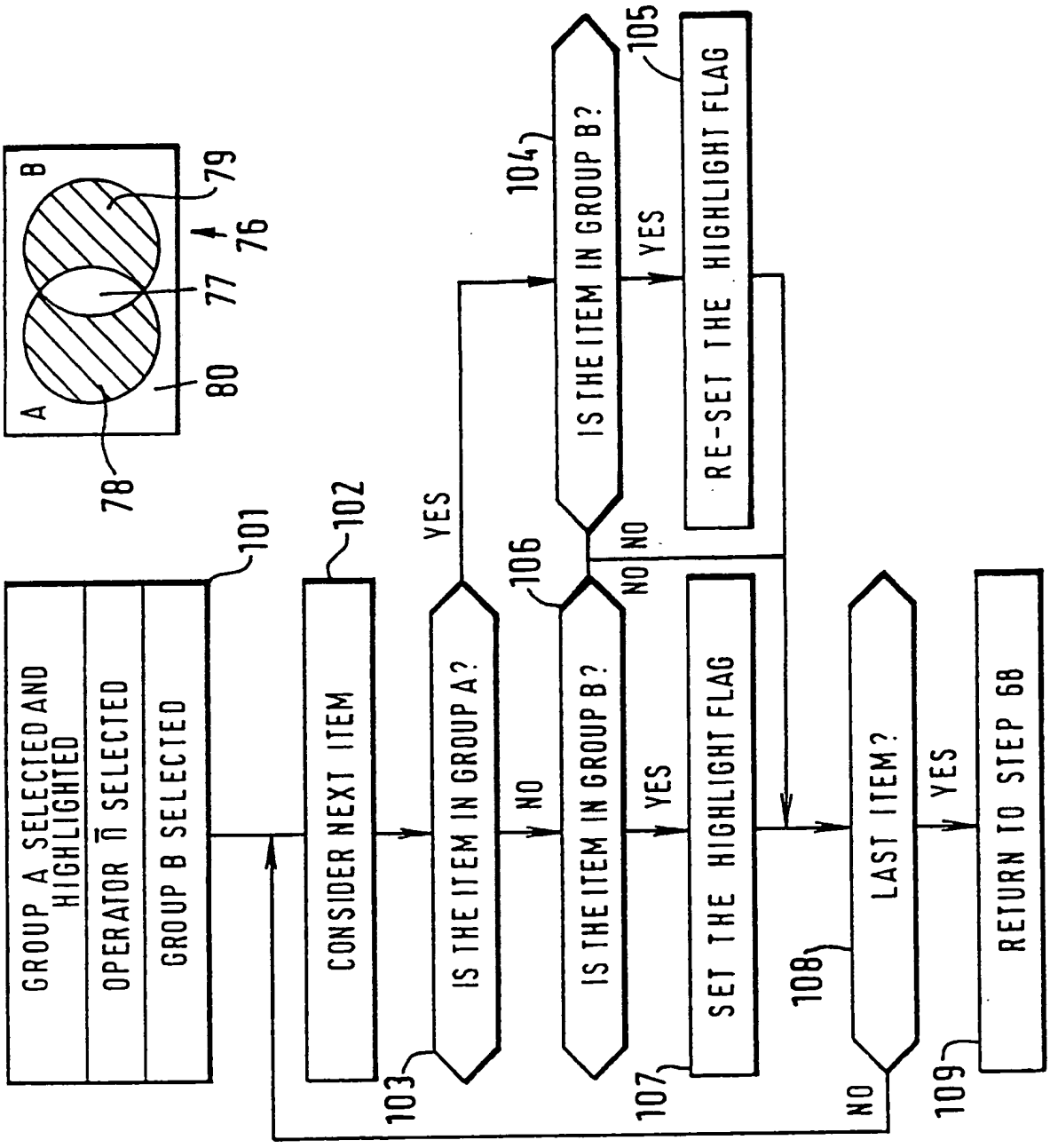
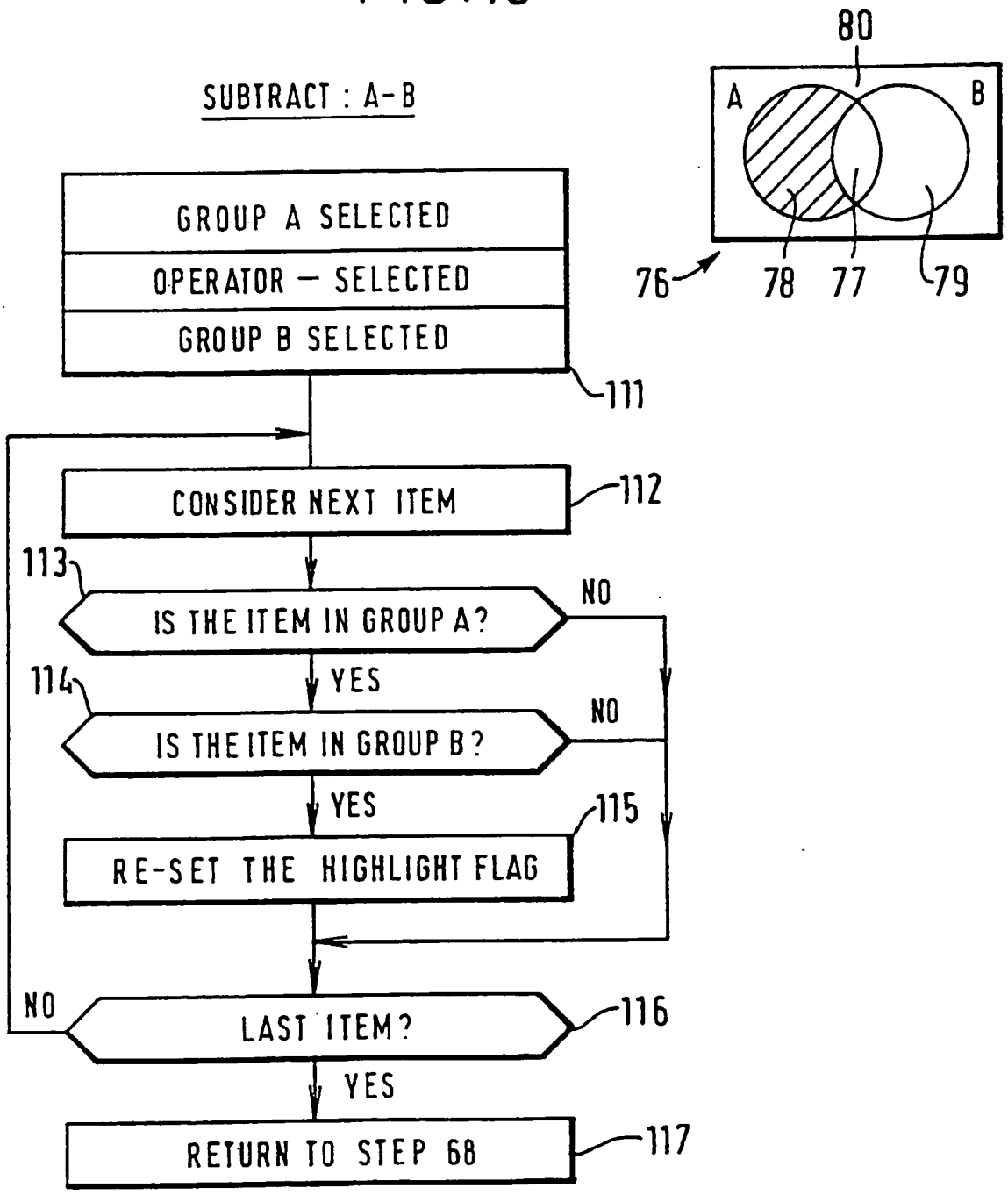

A
B
78
80
77
76
79
GROUP A SELECTED AND HIGHLIGHTED
OPERATOR ∩̄ SELECTED
GROUP B SELECTED
101
CONSIDER NEXT ITEM
102
IS THE ITEM IN GROUP A?
103
YES
NO
IS THE ITEM IN GROUP B?
104
YES
NO
RE-SET THE HIGHLIGHT FLAG
105
106
SET THE HIGHLIGHT FLAG
107
LAST ITEM?
108
NO
YES
RETURN TO STEP 68
109
NOT INTERSECTION: A∩̄B

FIG. 9

FIG. 10


SUBTRACT : A-B
GROUP A SELECTED
OPERATOR – SELECTED
GROUP B SELECTED
111
CONSIDER NEXT ITEM
112
113
IS THE ITEM IN GROUP A?
NO
YES
114
IS THE ITEM IN GROUP B?
NO
YES
115
RE-SET THE HIGHLIGHT FLAG
NO
LAST ITEM?
116
YES
RETURN TO STEP 68
117
80
A
B
76
78
77
79

INTERNATIONAL SEARCH REPORT

PCT/GB 93/00109

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 G06F15/403

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	G06F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
Y	EP,A,0 477 152 (IBM) 25 March 1992 see the whole document	1-34
Y	COMPUTER COMMUNICATIONS vol. 13, no. 4, May 1990, LONDON, GB pages 217 - 231 BERRA P.B. ET AL. 'Architecture for distributed multimedia database systems'	1-34
A	IEEE WORKSHOP ON VISUAL LANGUAGES, 4 October 1989, ROME, ITALY pages 130 - 137 TSUDA K. ET AL. 'Iconic Browser: An Iconic Retrieval System for Object-Oriented Databases'	1,9-34

-/--

° Special categories of cited documents : [10]

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
26 AUGUST 1993	31. 09. 93
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	SUENDERMANN R.O.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	SOFTWARE PRACTICE & EXPERIENCE. vol. 18, no. 3, March 1988, CHICHESTER GB pages 169 - 203 KIM H. ET AL. 'PICASSO: A Graphical Query Language' ---	1,9-34
A	IEEE PACIFIC RIM CONFERENCE ON COMMUNICATIONS, COMPUTERS AND SIGNAL PROCESSING, 10 May 1991, VICTORIA, B.C., CANADA pages 277 - 283 SHIROTA Y. ET AL. 'Image Database Construction Tools for RICOHBASE' -----	5,6

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

GB 9300109
SA 69922

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0477152	25-03-92	CA-A- 2050160	22-03-92
		JP-A- 4340659	27-11-92

EPO FORM P0479

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82